

BULLETIN

PENNSYLVANIA DEPARTMENT OF AGRICULTURE.

HARRISBURG, PA.

Vol. 8.

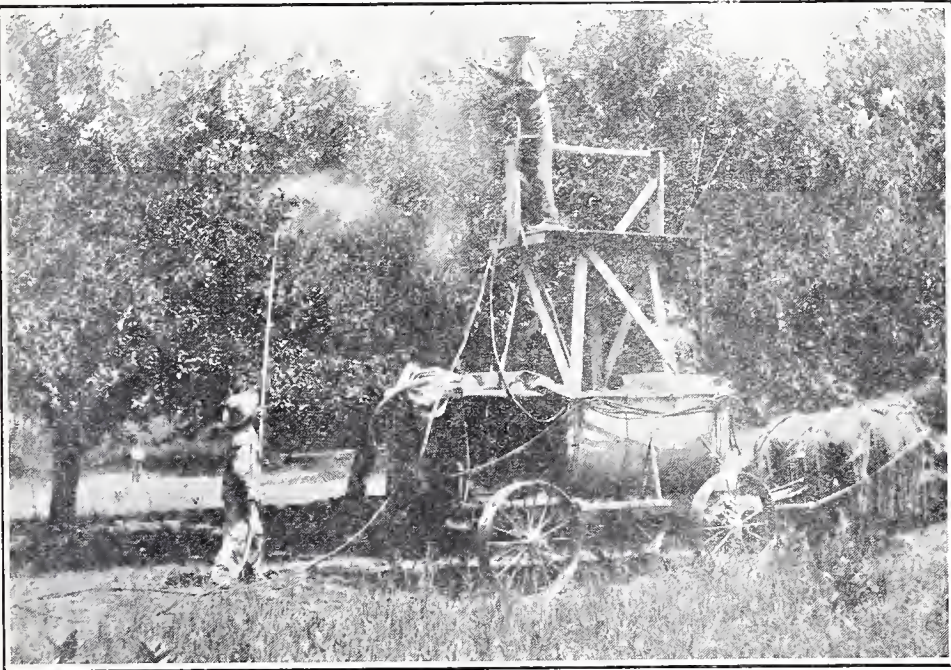
June, 1925

No. 10

General Bulletin No. 406

SPRAYS FOR THE JAPANESE BEETLE

By E. R. Van Leeuwen,
U. S. Bureau of Entomology



Gasoline power outfit for orchard spraying, showing a carpenter's horse type of tower.

F. P. WILLITS, Secretary of Agriculture.
C. H. HADLEY, Director, Bureau of Plant Industry.

Published semi-monthly by direction of the Secretary. Entered as second class matter, March 22, 1918, at the Post Office at Harrisburg, Pa., under the Act of June 6, 1900. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized on June 29, 1913.

SPRAYS FOR THE JAPANESE BEETLE¹

By E. R. Van Leeuwen, Assistant Entomologist, Bureau of Entomology,
United States Department of Agriculture.

Introduction

Japanese Beetle *Popillia japonica* Newm. usually appear, during a normal year, about the 15th of June and are abundant in the more heavily infested portions of the area from about July 1 to August 15, i. e., a period of six weeks. During this period the beetles are very active, feeding on the foliage or fruit of apple, cherry, peach and grape. The beetles feed also on certain shrubs, shade trees, and various other plants, in all over 200 species of plants being attacked to a varying degree.

The beetles feed on both sides of the leaf, the injury appearing as a pronounced skeletonization of the foliage, which turns brown



Fig. 1. Drawing to show the Japanese beetle at work on foliage.

with age. The fleshy fruit is eaten, and as is sometimes the case with the early peach nothing but the pit remains. To devise a practical means of preventing this injury to fruit and foliage, ex-

¹An extended account of the life history and habits of the Japanese beetle is given in bulletin 390 of the Pennsylvania Department of Agriculture, copies of which may be secured upon request.

The present bulletin has been prepared at the request of the Pennsylvania Department of Agriculture, at the Japanese Beetle Laboratory at Riverton, N. J., to meet the popular demand for authoritative recommendations for fighting the Japanese beetle. The Japanese Beetle Laboratory is the headquarters for the cooperative project between the Bureau of Entomology of the United States Department of Agriculture, the Bureau of Plant Industry of the Pennsylvania Department of Agriculture, the Bureau of Statistics and Inspection of the New Jersey Department of Agriculture, and the Delaware Department of Agriculture.

periments have been carried on over a period of several years, using various poisons in an effort to discover suitable methods of protection. A great many poisons and combinations of poisons have been tested. From the results of this work it has been observed that the ordinary insecticides in common use act as decided repellents rather than actually killing the beetles in large numbers. The combination which was found to afford the greatest protection to the foliage is a solution of acid lead arsenate, flour and water. A certain number of the beetles will feed upon the poisoned foliage and obtain a fatal dose, but the majority are repelled. In cases where a considerable area has been carefully sprayed, and unsprayed foliage is scarce, a higher percentage of kill is no doubt obtained.

General Directions For Spraying

Thoroughness of Application: Thoroughness in applying the sprays is of the utmost importance, and even fair results cannot be expected without it. The thoroughness of application cannot be over-emphasized and it is here that a little extra attention will secure better results. In orchards seriously infested with the Jap-



Fig. 2. Spraying shade trees with high-power outfit. It is essential that the tops of certain varieties of trees are covered with a coating of spray to prevent injury by the beetle.

anese beetle, complete control is more difficult than where the infestation is slight or negligible. Inasmuch as the beetles feed on the upper and lower sides of the leaf, the spray should be directed to completely cover both sides of the leaf with a film of poison. To spray large trees thoroughly it is essential to use a high-pressure outfit and a tower in order to reach the topmost branches (See Cover Page and Fig. 2). These are attacked first, and once the beetles have obtained a foothold, others may be attracted, and result in a heavy infestation.

Timeliness of Application: In order to protect the foliage and fruit from the attacks of the beetle it is necessary to have the spray applied before infestation takes place. The beetles are gregarious in nature and often cause severe injury within a short period of time. The later the spray can be applied, prior to beetle injury, the longer will be the protection afforded by the spray. During a normal or average year, beetles will begin to cause injury about June 25, therefore to obtain the best results, the spray must be applied not later than the above date.

Do not wait until the foliage is being injured by the beetle before spraying. It may be necessary in some cases to repeat the application from 3 to 4 weeks later, but additional applications beyond this second may result in foliage injury.

Recommendations for Control

Material to Use: The material to use is a combination of acid lead arsenate in powdered form, ordinary household flour, and water. In mixing up these materials to make the spray solution, mix the lead arsenate and flour together while dry, and then add sufficient water to make a paste. Add enough additional water to the paste so that the material can readily be poured into the spray tank, and then add the balance of the water as necessary, according to the size of the tank and the rate of dilution. The opening in the spray tank should be provided with a removable brass screen through which the liquid is poured, in order that any coarse particles of flour and lead arsenate, or any other foreign material, may be broken up or prevented from getting into the solution, from which it might get into the hose and clog up the nozzles.

Late and Early Apples: Spray early and late varieties of apples with 3 pounds of powdered lead arsenate and 2 pounds of ordinary flour to 50 gallons of water. The usual spray schedule for apples calls for an application of lime sulphur about the time the beetle spray should be applied. Under these conditions the lime sulphur spray should be considered a separate spray and applied two or three days before the beetle spray. The use of such large amounts

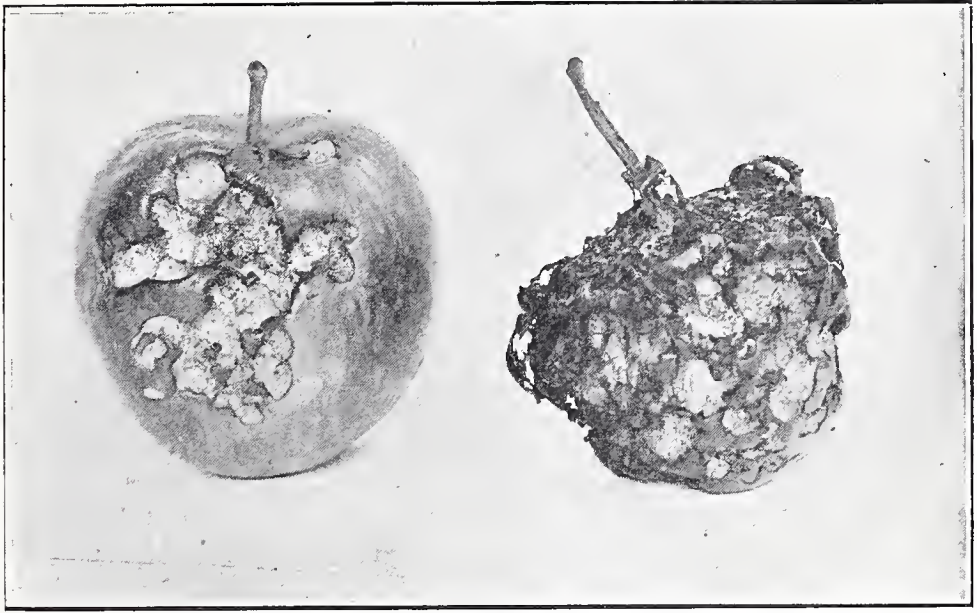


Fig 3. Apples which have been eaten by the beetles, showing how such fruit is completely ruined for commercial purposes (N. J. Dept. of Agr.).

of lead arsenate as are required to protect foliage from Japanese beetle injury, in combination with lime-sulphur, is quite liable to cause "burning" or foliage injury.

Early ripening varieties of apples are especially susceptible to injury by the beetle (Fig. 3). In cases where it is necessary to apply the spray close to the picking date, there is some danger from spray residue remaining on the fruit. To prevent the apples reaching market in such condition it is necessary to remove the residue by running the apples through a grader equipped with rotary brushes, or by wiping the apples with a cloth.

Late and Non-bearing Peaches: Because the tender foliage of the peach is very susceptible to arsenical injury, only $1\frac{1}{2}$ pounds of powdered lead arsenate to 50 gallons of water should be used. To the lead arsenate add 2 pounds of flour and the "milk" from 3 pounds of slaked lime. Peaches must not be sprayed with arsenate of lead closer than three or four weeks to the time of harvest. In most cases the beetle spray can be applied on late varieties early enough to allow the arsenate of lead residue to be washed from the fruit by rains before marketing.

Early Peaches: The early peach in the infested area is harvested while the beetles are very abundant. (Fig. 4) Sprays applied at this time leave a heavy deposit of poison on the fruit which cannot be removed without injury to the peach. Such peaches have no market value. On account of this condition no spray application



Fig. 4. Beetles feeding in clusters on early peaches. This injury is characteristic and very noticeable in heavily infested districts.

can be recommended at this time to protect early peaches from the attack of the Japanese beetle.

However, some success has been obtained when the lead arsenate used for the control of the plum curculio prior to the beetle spray was applied in the form of spray instead of a dust. It is believed that a certain amount of lead arsenate will accumulate and that this accumulation will have a tendency to prevent the attacks of the beetle later in the season. It is also of some value to spray all trees surrounding the early peach orchard with the heavy application of lead such as is recommended for apples, providing those trees are of such nature that they can withstand the application of a large amount of lead. Such a spray will have a tendency to prevent the beetles from congregating in that particular area. In cases where early peach trees are heavily infested large numbers of beetles can be collected in the early hours of the morning by jarring the trees, the beetles collecting on the canvas which has previously been placed beneath the tree. At this time it is cool and the beetles are more or less inactive. As the beetles are gathered they can be

poured into tubs from the canvas sheet and later destroyed by spraying with kerosene oil and burned or buried.

Sweet and Sour Cherries: Owing to the fact that cherries are harvested close to the period of applying the beetle spray, it is not advisable to spray until the crop is picked. If the beetles are causing very serious injury prior to harvesting the fruit, some protection can be obtained by applying a spray consisting of $1\frac{1}{2}$ pounds of lead arsenate, 2 pounds of flour to 50 gallons of water.

Grapes: The usual spray schedule recommended for grapes in the infested area calls for an application of Bordeaux mixture (4-5-50 formula) with 2 to 3 pounds of arsenate of lead to 50 gallons of water, applied 10 days after the blossoms fall. For control of the Japanese beetle the same mixture should be used, but 3 pounds of powdered arsenate of lead must be added to each 50 gallons of Bordeaux and the application should be completed by June 25. Beetles may cause some injury during July or early August but the attacks will be largely confined to new foliage.

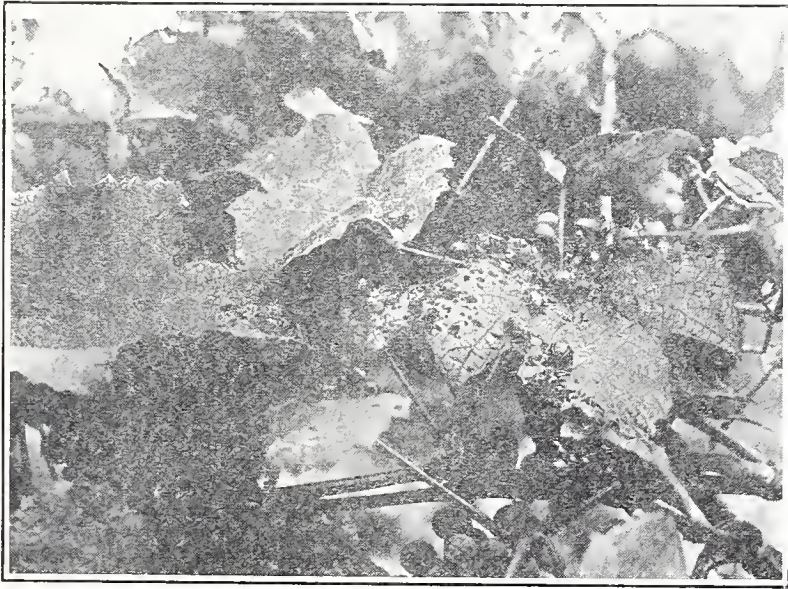


Fig. 5. Beetles feeding on grape foliage in midsummer. (U. S. Dept. Agr.)

Shade Trees and Ornamental Shrubs: For protecting various shade trees, such as elms, lindens, sassafras and horse-chestnut, and ornamental shrubs, including roses, althea, and others, use 3 pounds of lead arsenate and 2 pounds of flour to 50 gallons of water.

Where only a few shrubs are to be sprayed and small amounts of the solution are to be used, the amount of material per gallon of water should be about 3 tablespoonsful of powdered arsenate of lead and 2 tablespoonsful of flour. A table for varying other amounts is given.

Dilution Table

		Gallons of Spray Solution to Make—							
Material	At rate of	1 gal.	3 gal.	5 gal.	10 gal.	25 gal.	50 gal.	100 gal.	200 gal.
Lead Arsenate Powder	3 lbs. to 50 gal. water	1 oz.	3 oz.	5 oz.	9.5 oz.	1.5 lb.	3 lb.	6 lb.	12 lb.
Flour (ordinary baking)	2 lb. to 50 gal. water	.6 oz.	2 oz.	3 oz.	6 oz.	1 lb.	2 lb.	4 lb.	8 lb.

